Eastern University, Sri Lanka
Faculty of Commerce and Management
Second Year-Second Semester Examination in Bachelor of Business
Administration Honours/Bachelor of Commerce Honours- 2020/2021
(July/August 2023) [Proper/Repeat]
MGT 2053 Management Science

Answer All Five Questions   **Time: 03 Hours**

Q1.

Beta company has three production centers A, B and C producing a certain product at a level of capacity of 100, 120 and 80 units respectively. The products produced are distributed among four sales centers W, X, Y and Z demanding the product of 40, 140, 100 and 20 units respectively. The following Table shows the per unit transportation cost from production centers to sales centers.

	W 40	X 140	Y 100	Z 20
A 100	25	75	35	30
B 120	40	36	45	5
C 80	8	44	40	41

(a) Find the total minimum transportation cost for initial allocation using the **North-West Corner Rule Method.**

(b) Based on the initial feasible solution of North-West Corner Rule Method, find the total optimum transportation cost using the **MODI** method.

(Total 20 Marks)

Q2.

(a) A producer of an electronic equipment has just received a sizable contract and plans to subcontract part of the job. He has requested bids for 6 subcontracts from 4 firms. Each job is sufficiently large and any firm can take only one job. The following Table shows the bids as well as the cost estimates (in lakhs of rupees) for this assignment.

Firm \ Job	1	2	3	4	5	6
1	64	67	41	53	48	44
2	68	69	40	45	45	46
3	62	73	37	51	44	43
4	63	65	35	50	46	50

Find the optimal assignment that will result in minimum total cost.

(b) A company is faced with the problem of assigning 4 machines to 6 different jo (one machine to one job only). The profits are estimated as follows:

Job	Machine			
	M1	**M2**	**M3**	**M4**
1	30	60	20	60
2	70	10	40	40
3	30	80	50	80
4	60	40	30	70
5	50	20	40	30
6	50	70	60	40

Find the optimal assignment that will result in maximizing the total profits.

(Total 20 Marks

Q3.

The following activities, with associated costs and times, represent those necessar for the completion of a project to be started by your organization next month.

Activity	Preceding Activity(ies)	Normal		Crash	
		Cost (Rs.)	Time (Days)	Cost (Rs.)	Time (Days)
A	-	250	5	370	3
B	A	160	4	160	4
C	A	360	6	750	3
D	A, C	490	7	950	6
E	B, C	640	8	1,300	4
F	E, D	390	6	760	3
G	E, F	230	5	450	3

The cost and time in the 'crash' columns are the estimates for an alternative time except for **activity B,** and represent the total (not extra) cost of the new, shorte time for each activity.

Fixed costs associated with the project are estimated at Rs. **300** per day.

You are required to draw the network and calculate:

(a) The normal duration and normal cost of the project.

(b) The minimum duration and associated cost of the project, and

(c) The minimum cost of completion and the associated duration of the project.

(Total 20 Marks

Q4.

(a) The annual demand **(D)** for a product is 5000 units. The purchasing price of the product is Rs. 80 per unit and the cost of order **(Co)** is Rs. 400. The company estimates its carrying costs of that product to be **(CH)** 0.25Q per unit per year. What is the total cost of inventory of that product at EOQ level (including purchasing cost)?

(b) ABC Ltd. uses EOQ logic to determine the order quantity for its various components and is planning its orders. The Annual consumption is 80,000 units, Cost to place one order is Rs. 1,200, Cost per unit is Rs. 50 and carrying cost is 6% of Unit cost. What is the number of orders per year?

(c) Abi Company which has annual sales (D) of 20,000 units. Ordering cost is Rs. 200 per order. The purchasing cost per unit is Rs. 80, and inventory holding cost is 10% of the price per unit per year. Given the 1000-order quantity, what would be the total annual inventory cost (including purchasing cost)?

(d) The XY Company, which has annual sales (D) of 20,000 units. Ordering cost is Rs. 200 per order. Their purchase cost per unit is Rs. 80, and inventory holding cost is 10% of the price per unit per year. The supplier offers a 5% volume discount (price break) on orders of 2000 units or more. What would be the minimum total annual inventory cost (including purchasing cost)?

(e) A firm uses a material in the production process of its products which it orders from a local supplier. The following information are given below:
Annual Demand (D) = 1600,000 Units
C_H = Rs. 4/=
Ordering cost per order (Co) = $[(400/N) + 80]$
N = Number of Orders
Find the 'N' that minimize the Total Inventory Cost and EOQ of the Material.

(Total 20 Marks)

Q5.

(a) Solve the following Linear Programming problem through simplex method and interpret the solutions.

Objective Function: **Maximize $Z = 2X_1 + 3X_2 + 4X_3$**

subject to the constraints:

$$5X_1 + 2X_2 + 4X_3 \leq 12,000 \text{ (Material-1)}$$
$$4X_1 + 5X_2 + 6X_3 \leq 24,000 \text{ (Material-2)}$$
$$3X_1 + 5X_2 + 4X_3 \leq 18,000 \text{ (Material-3)}$$

where $X_1 \geq 0$, $X_2 \geq 0$, and $X_3 \geq 0$

(10 Marks)

(b) Solve the following Linear Programming problem through simplex method a
interpret the solutions.

Objective Function:

Minimize Z $= 2X_1 + 10X_2 + 8X_3$, subject to the constraints:

$$X_1 + X_2 + X_3 \geq 60 \text{ (Material-1)}$$
$$X_2 + 2X_3 \geq 80 \text{ (Material-2)}$$
$$2X_2 + 2X_3 \geq 40 \text{ (Material-3)}$$
$$\text{where } X_1 \geq 0, X_2 \geq 0, \text{ and } X_3 \geq 0$$

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(Total 20 Mar